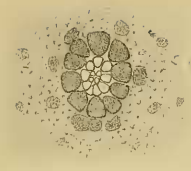
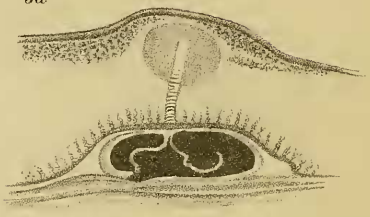


2

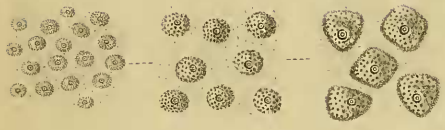
3a

3b

1b



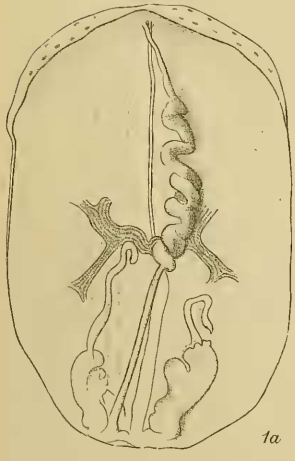
3c



1c

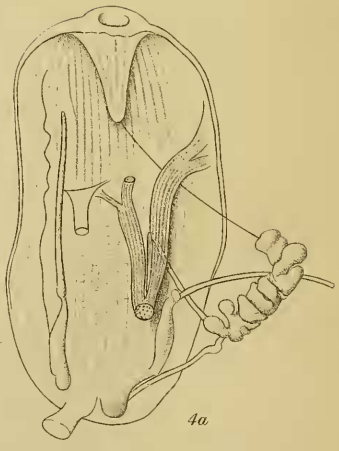
5

4c



1a

4b



4a

E. Wilson, Cambridge.

GEPHYREA FROM THE MALAY PENINSULA.

species, though it might possibly be referable to *Th. pellucidum* Fischer, which is, however, a Western form.

The muscles number 12 or 13, but some of them are so indistinct as to make it impossible to be quite certain. The anal trees are quite short, brown, tapering, and simple. No other internal features can be made out. The proboscis is 10 mm. in length as compared with a body length of 40 mm., and in this agrees with Fischer's species (*cf.* Shipley, Willey's Zool. Res. part iii. p. 351).

Each ventral hook has an accessory hook of about the same size lying close to it.

20. THALASSEMA DECAMERON, sp. nov. (Plate I. fig. 5.)

Loc. Chwaka, Zanzibar.

Hab. In sand.

One specimen.

This species is characterised by the presence of four pairs of nephridia, which are, however, small in this individual and only slightly elongated. Two of them, moderately distant from each other, lie behind the setæ; and the other two, much closer together, in front of the setæ.

The body-wall is extremely thin; internally it is possible to distinguish ten, fairly broad, but inconspicuous, longitudinal muscles, which can also be seen from the outside shining through the skin. The anal trees are long, broad and brown at the base, but soon tapering and becoming transparent; simple and not dendritic in this individual.

EXPLANATION OF PLATE I.

Fig. 1. *Physcosoma evisceratum* (p. 31). *a*. Papilla from the front end of the body. *b*. Papilla from the hind end of the body. *c*. Hook.

Fig. 2. *Phascolosoma vulgare*, var. *selenkæ* (p. 31). *a*. Papilla from the introvert. *b*. Hook.

Fig. 3. *Phascolosoma glaucum* (p. 32). *a*. Dissection showing internal anatomy. *b*. Papilla from the front end of the introvert.

Fig. 4. *Phascolosoma wasini* (p. 32). *a*. Dissection showing internal anatomy. *b*. Papillæ from introvert.

Fig. 5. *Thalassema decameron* (p. 35). *a*. Body laid open, to show nephridia, muscles, and anal trees. *b*. Skin from mid-body.

6. On the Sipunculids and Echiurids collected during the "Skeat" Expedition to the Malay Peninsula. By W. F. LANCHESTER, M.A., Assistant Lecturer and Demonstrator in Zoology in University College, Dundee *.

[Received November 1, 1904.]

(Plate II.†)

This collection, which Mr. Shipley kindly put into my hands for determination, contains 12 species of Sipunculids and 1 of Echiurids; the latter is a new form, as are also four of the

* Communicated by the SECRETARY.

† For explanation of the Plate, see p. 41.

Sipunculids. I will do no more here than call attention to the discovery of an Eastern form (= *Physcosoma gaudens*, nov.) corresponding rather closely to the Western *Ph. weldonii*, and to the somewhat curious position of the anus in the new form *Phascolosoma pyriformis*.

Sipunculida.

I. Genus Sipunculus.

1. Sipunculus cumanensis Kef.

Selenka, Die Sipunculiden (Semper's Reisen, p. 104).

Loc. Penang.

Two specimens of the variety *opacus*.

The bodies of these two individuals are much longer, relatively to the introvert, than was stated by Selenka, who wrote "Rüssel ungefähr ein Drittel der Körperlänge": here, however, the introvert is only one-sixth of the body-length. The measurements for the two specimens are:—

(*a*) Introvert 43 mm., body 253 mm.
(*b*) ,, 28 mm., ,, 150 mm.

Probably this difference is due to the different relative contraction of the two parts of the animal in these as opposed to Selenka's specimens.

2. Sipunculus australis Kef.

Selenka, *tom. cit.* p. 90.

Loc. Pulau Bidan, Penang.

Two specimens.

In the one specimen dissected the ventral retractors arise from three, instead of four or five, muscle-bands, those three being the first to the third on each side of the nerve-cord.

II. Genus Physcosoma.

3. Physcosoma scolops Sel. & de Man.

Selenka, *tom. cit.* p. 75.

Loc. Pulau Bidan, Penang.

Numerous individuals.

In several of these specimens the skin is less transparent, so that the longitudinal muscle-bands do not shine through it; gradations may be traced, in others, between this and the typical transparent form.

4. Physcosoma nigrescens Kef.

Selenka, *tom. cit.* p. 72.

Loc. Pulau Bidan, Penang.

Three large, and one very small, specimens.

5. PHYSCOSOMA LURCO Sel. & de Man.

Selenka, *tom. cit.* p. 61.

Loc. Trengganu.

Numerous examples.

In the text Selenka speaks of "zwei vorderen Retractoren," but in the figure he shows them as arising in the same transverse line; in these specimens the dorsal retractors arise behind the ventral in the same longitudinal line, and so from the same muscle-bands, namely the first and second. Moreover, according to Selenka's figure, the four retractors fuse, after a short course, to form two retractors, and these two, again after a short course, again fuse to form one; here, however, the four retractors fuse immediately into one after a short course. Further, I may mention that the anus is not necessarily conspicuous as described by Selenka. In many cases it is quite indistinguishable; in many others it appears as a rather sunken cleft-formed opening, and in only a few cases as a round opening raised on a high papilla. As in the case of *Sip. cumanensis*, this difference of detail may be explained, without doubt, by the differing states of contraction in the various examples, either of the animal as a whole or of the anal sphincter or of both.

6. PHYSCOSOMA SOCIUM, sp. nov. (Plate II. fig. 1.)

Loc. Pulau Bidan, Penang.

Three specimens.

Introvert nearly half as long as the body and thickly covered, especially in front, with flattened dark papillæ, which posteriorly become more conical, smaller, lighter in colour, and less densely crowded. Those on the extreme hind end of the body are very like those on the front of the introvert, but over the body generally they are much more widely scattered, appearing as brown spots against the paler background of the semitransparent skin. These papillæ are formed of numerous concentric plates, and very closely resemble those of *Ph. psaron* Sluiter (*v.* fig. 1 *b*). There are no hooks on the introvert. The longitudinal muscles number 18–21 in the middle of the body, with occasional anastomoses; close to the posterior end there is a distinct convex line along which they again anastomose slightly, so that behind this line there are relatively fewer muscles. The four retractors fuse as soon as they meet; the ventral pair arise just behind the middle of the body from muscles 2–6, the dorsal just in front of the middle of the body from the 5th–6th muscles. The contractile vessel is without diverticula. The intestine has few (about 8–10) spirals; it is held to the posterior end of the body by the spindle-muscle and anteriorly by two strands inserted to the left of the nerve-cord; the rectum is long and opens near the base of the introvert. The nephridia are attached for two-thirds of their length, which is about half that of the body; their anterior halves are much swollen and their openings lie just behind the level of the anus.

Examination under the microscope of the skin of the introvert shows that, for about half its length, the papillæ are similar to those on the body, but that anteriorly they gradually become flatter, the plates becoming much smaller and losing their concentric arrangement, so that the whole appears as a granular area surrounding the central opening. In the dorsal half of this anterior region, moreover, they become surrounded by thick bands of brown pigment which form a dense network between them and tend to obscure their height, but in the ventral half the pigment is absent and it is easy to trace their gradual flattening (Pl. II. fig. 1 *c*).

This species is obviously very like *Ph. psaron*, but there are certainly no spines on the introvert and the papillæ differ in certain features. Thus Sluiter says "Sonst kommen im Rüssel nur dunkle Leisten vor, aber keine gesonderte Papillen," which hardly agrees with the arrangement found here. Otherwise the general anatomy is closely similar, save only that the nephridia are half and not three-quarters the length of the body, and attached for two-thirds and not one-third of their own length. Sluiter's description is rather brief and he has not figured his species, but I feel reasonably certain that the two forms are distinct.

7. Physcosoma gaudens, sp. nov. (Plate II. fig. 2.)

Loc. Pulau Bidan, Penang.

Three specimens.

This form would appear to be the Eastern representative of the Western *Ph. weldonii*, Shipley. In all general features it closely resembles the latter, but in regard to the papillæ of the body it is distinctly different; these consist, in Shipley's species, of a number of brown horny plates with pigment in between, while in the present species they consist of two rings of small transparent plates round the central opening, then a ring of about six large brown plates, and then another more or less complete ring of slightly smaller irregular brown plates, pigment granules being absent (fig. 2). The actual resemblances between the two forms are the relative shortness of the introvert and absence of hooks, the brown papillæ especially crowded on the introvert, the presence of only two retractors, and the diverticula on the contractile vessel. The differences, except as regards the body-papillæ, are slight and obviously only differences of degree, and I give them in tabular form :—

Ph. weldonii.	*Ph. gaudens.*
Longitudinal muscles 10–12, splitting into two in the middle of the body, and fusing at hind end.	Muscles 14, splitting in the middle of the body, but into more than two, so that posteriorly there are as many as 34; not fusing at hind end.
Opening of nephridia a little behind anus.	Opening of nephridia at anus level.
Retractors arise at a level between the anterior two-thirds and the posterior one-third of the body.	Retractors arise at the level of the middle of the body.

III. Genus Phascolosoma.

8. Phascolosoma pyriformis, sp. nov. (Plate II. fig. 3.)

Loc. Pulau Bidan, Penang.
Numerous specimens.

The expanded animal is pyriform in shape, the introvert being considerably shorter than the body. The skin is thick, without papillæ when seen under the lens; in most of these specimens the colour is a dirty-white with a slight tinge of very pale green which may be due to the reagent. Some, however, are distinctly reddish-brown (*i. e.*, a lightish copper), and in nearly all it is noticeable that the skin is covered with splashes of white, which just behind the tentacles are aggregated into a broad white ring.

Internally the most peculiar character is that both anus and nephridia open on the introvert, the anus halfway between its base and the tentacles, the nephridia just in front of its base (*v.* fig. 3 *a*). The muscle-layers are continuous, and there are two broad and short retractors which arise within the middle third of the body and fuse directly they meet. The œsophagus, covered by a contractile vessel with numerous black-tipped diverticula, extends to the extreme hind end of the body (at which point the contractile vessel ceases), and then bends sharply forward dorsal to the intestine to enter the latter at the anterior end of the body; in its anterior half this part of the œsophagus is held in place by three small muscles which converge to be inserted fairly close together in the mid-dorsal line. The intestine is much coiled and opens at the anus by means of a rather short rectum; it is not held down to the hind end of the body, but is attached in front by means of the spindle muscle. The nephridia are about a quarter of the body-length, hardly pigmented, their anterior portion swollen.

The papillate bodies consist of (*a*) a low circular papilla, with a wide central opening, on the external body-wall, (*b*) of the glandular portion, lying rather deep down below the cutis and epidermis, and (*c*) of a fairly long, more or less straight duct, leading to the external opening (*v.* figs. 3 *b*, 3 *c*).

IV. Genus Cloeosiphon.

9. Cloeosiphon aspergillum Quatrefages.
Selenka, *tom. cit.* p. 126.

Loc. Pulau Bidan, Penang.
One specimen.

V. Genus Aspidosiphon.

10. Aspidosiphon steenstrupii Diesing.
Selenka, *tom. cit.* p. 116.

Loc. Pulau Bidan, Penang.
One specimen.

11. ASPIDOSIPHON ELEGANS Cham. & Eysenh.
Selenka, *tom. cit.* p. 124.

Loc. Pulau Bidan, Penang.
Fifteen small specimens.

12. ASPIDOSIPHON INSULARIS, sp. nov. (Plate II. fig. 4.)

Loc. Pulau Bidan, Penang,
Two damaged specimens.

The longitudinal muscles are split into bundles which anastomose rather freely; they appear stronger behind the level of the retractors, where they number about 22, but in front of this level the transverse bands appear more prominent and the longitudinal muscles number only 15. The retractor muscles are four in number, and take their origin a little behind the middle of the body, the ventrals arising from longitudinal muscles 2–6, the dorsals from 5–6 only, a very little distance in front of the ventrals; the pairs unite very quickly, but the united pairs do not join till moderately close to the tentacles. The nephridia are long, extending from their opening, at the same level as the anus, close to the base of the introvert, to some little distance behind the retractors; they are brown in colour, and attached only in their front portion, which is slightly swollen. A well-marked spindle-muscle holds the intestine down to the hind end of the body, which, in the specimen figured, is invaginated for a little distance.

Externally the body is a dirty-white and dotted with small brown papillæ, which in the middle of the body are only visible under the lens, but which increase in size towards the hind end. The anal shield is circular, and formed of crowded, large, brown papillæ. The introvert is less than half the length of the body; in front it carries a few rows of hooks (fig. 4 *b*), and behind rather large papillæ, each of which terminates in a dense, almost tooth-like structure (fig. 4 *c*). Along the dorsal line the papillæ are enclosed by a dense brown pigment.

ECHIURIDA.

VI. Genus THALASSEMA.

13. THALASSEMA SABINUM, sp. nov. (Plate II. fig. 5.)

Loc. Tale Sab, Singora. "In channel at top of brackish part." Five specimens.

The characteristic features of this species are as follows:—

a. The proboscis is short as compared with the body;
b. There are two pairs of nephridia with spiral openings;
c. The muscle-sheath is continuous;
d. The anal trees are short;

which conjunction of characters at once separates it from the other members of the genus. The animal is small, measuring in

one instance 10 mm., of which the proboscis forms only the fifth part, *i. e.* 2 mm. The ventral hooks lie close up behind the proboscis. The skin is rather thin, and only partially transparent so far as concerns most of the internal organs, but the nerve-cord is clearly visible from the outside. The structure of the papillate bodies is shown in fig. 5.

EXPLANATION OF PLATE II.

Fig. 1. *Physcosoma socium* (p. 37). *a*. Dissection showing internal anatomy. *b*. Papilla from mid-body. *c*. Skin of introvert, showing gradual flattening of the papillæ.
Fig. 2. *Physcosoma gaudens* (p. 38). Papilla from the hind end of the body.
Fig. 3. *Phascolosoma pyriformis* (p. 39). *a*. Dissection showing internal anatomy. *b*. Papilla from the front end of the body, surface view. *c*. The same in section.
Fig. 4. *Aspidosiphon insularis* (p. 40). *a*. Dissection showing internal anatomy. *b*. Hooks. *c*. Papilla from the base of the introvert.
Fig. 5. *Thalassema sabinum* (p. 40). Skin from the front of the body.

7. On the Oral and Pharyngeal Denticles of Elasmobranch Fishes*. By A. D. Imms, B.Sc. (Lond.), Zoological Laboratory, University of Birmingham.

[Received November 1, 1904.]

(Plate III.†)

It is well known that in the Elasmobranch Fishes true teeth are carried only in relation with the palato-quadrate and mandibular cartilages. Minute denticles, however, may be present in greater or less abundance in many parts of the lining of both the oral and pharyngeal cavities. Very little has been written with regard to these structures, and, although reference is made to them by Hertwig, Popta, and others, the only general description of them is that recently published by Steinhard‡.

I have been led to devote some attention to them as the outcome of an account which I have recently given of the structure of the gill-rakers of the Ganoid Fish *Polyodon spathula* §. In that paper I suggested that the gill-rakers of *Polyodon* may perhaps be regarded as scales (or denticles) which have migrated from the exterior of the body on to the branchial arches, and have there become greatly modified into long setiform structures. In order further to test the possibility of this suggestion, I have examined examples of species belonging to a considerable number of genera of Elasmobranchs for the purpose of ascertaining whether denticles of any description are present on the branchial arches in those Fishes. Given the presence of denticles on the branchial arches in such forms, it would not be difficult to conceive that the type of

* Communicated by Prof. T. W. Bridge, F.R.S., F.Z.S.
† For explanation of the Plate, see p. 49.
‡ Archiv für Naturgesch. lxix. Bd. i. 1903, pp. 1–46, Taf. i. & ii.
§ Proc. Zool. Soc. 1904, vol. ii. pp. 22–35, pl. ii.